# TALLAHASSEE AREA
# MINIMUM TEMPERATURE STUDY
# Monthly Report-July 2002


## National Weather Service-Tallahassee
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## Introduction

This is the eighth monthly report describing minimum temperatures in the Tallahassee area. It is part of a long term joint research project between the National Weather Service in Tallahassee and the Florida State University Department of Meteorology.

## *July 2002*

This month was normal for temperatures and somewhat drier than normal for rainfall. This precipitation deficiency follows a pattern similar to that of the previous spring and early summer season months. The average minimum temperature at the Tallahassee Regional Airport during July 2002 was 71.9 degrees, compared to the 30-year July average of 71.6 degrees. The airport recorded 6.41 inches of rain, but other unofficial county rain gauges recorded considerably higher totals. The July normal is 8.58 inches. Although seventeen days indicated measurable precipitation, 39 percent of the airport total, 1.77 and 0.83 inches fell on two days, the 28th and 8th, respectively. During the Spring and into the summer season, cumulative airport rainfall has totaled around 12 inches below normal. Seventeen observers participated in the study, and their locations are indicated on the map (Figure 1). The observer locations represent a wide spatial distribution across Leon County.

1. TALLAHASSEE AREA JULY 2002 REVIEW

Table 1 gives July daily minimum temperatures as well as means and standard deviations for each location in the network. These data can be used to compare any site with the other sixteen. The coolest average readings occurred on the 4th-6th when minimums dropped to 68.5-69.7 degrees. The 25th and 31st also recorded average minima below 69 degrees. The mildest readings were noted on the 18th-20th when coolest temperatures ranged from 75.2-75.7 degrees. The only significant frontal systems this month occurred on the 28th on the 7th-9th and on the 22nd-24th. Typical frontal activity was represented by the relatively strong cold front followed by a warm front that slowly approached and then traversed the area on the 28th into early on the 29th dropping 28% of monthly airport total. Onshore flow, dense fog and low clouds associated with the warm front were noted. As with June frontal passages, temperature ranges across the network prior to, during and after this event demonstrated little daily variation. In July, ranges were only 2-3 degrees on many nights, lower than in June (3-7 degrees) and noticeably lower than in May when ranges during the mildest nights were

8-11 degrees, and the coolest nights 10 to 15 degrees. As expected, the disparity in daily ranges was even greater between July and the four winter months. Although, daily ranges remained relatively large for Tallahassee when compared to other small cities, warm season disparities significantly narrowed.

## 2. JULY 2002 MINIMUM TEMPERATURE EVALUATION

Figure 2 is a station histogram which shows how your site ranks in comparison to the other sixteen sites during July 2002.

Table 2, labeled “Frequency of Extremes”, demonstrates another way to view the data. It is more informative than simple raw data or rank histograms, telling how many times (and the percentage of times) that your station ranked as one of the coldest or warmest four sites on a particular day.

### a) Coldest and warmest sites

Only three of the five coldest sites during July also were the coldest during June. These are (in order) Canopy, Chiles, Lanier, Lundy and Oak Ridge. However, this decrease in monthly consistency may be misleading. Chiles and Lanier did not report in May or June and McCool, a traditionally cool station, finished a close sixth. Four of the five warmest sites this month are the same as those during June. These are (in order) Brogan, Winsberg (both were among the four warmest on each day), FSU, Wakulla, and TLH. FSU (previously sixth) switched places with Bellenot. Therefore, these data imply a persistent monthly consistency in the spatial distribution of minimum temperatures. Most of the warmer sites (Wakulla and TLH being the exception) are located in or near downtown, in areas dominated by artificial surfaces, especially asphalt, as well as the counties tallest buildings. These data substantiate, that, although ranges decrease with increasing minimums, a clear urban heat island exists in the Tallahassee area. The monthly consistency in the spatial distribution of cold and warm sites continues to validate the data presented.

### b) Topography, natural surfaces and soil type

Although July ranges were only 6-8 degrees on the coolest nights, or around one third those during the winter, the results continue to show larger than expected daily temperature variations associated with the Tallahassee urban heat island. As with all previous months, the five coldest sites were located away from downtown, with four of them in the most rural parts of the county where natural surfaces dominate. Two are in the northwest, two in the north and one in the south quadrants. As indicated in previous reports, the spatial distribution of topography and soil type likely influences temperature distribution. Four of the coolest county sites during July were situated in the north or more hilly half, with one located in the south quadrant. In the south, sandy soils predominate which are more effective emitters of radiation than the prevailing area clay soils. This spatial distribution contrasts with June when the previously warmer eastern quadrant sites like Elsner and Nayak ranked near the top during cooler events. In fact,

the July spatial distribution is more closely aligned with the winter and spring season months. Thus, June, may, in fact, have been an anomaly. Future reports will determine which month best reflects warm season trends.

c) Wind speed and direction

The July data continue to validate classical urban heat island studies which indicate that minimum temperatures generally decrease as you move away from the city center. Perhaps of greater interest is the spatial distribution of cold sites during and after a frontal passage. Summer frontal passages are infrequent and significantly weaker than during the winter and even the spring season. Consequently, average and peak wind speeds during July were noticeably lower than during previous months. This decrease had some influence on the spatial distribution of coldest sites. As expected, when winds were highest, windward sites (north facing slopes) over the north and northwest quadrant were the coldest. This included Chiles, Canopy and Lundy. However, they were only several degrees cooler than rural southern sites like Oak Ridge and McCool. This contrasts sharply with cooler months when on prefrontal and frontal days, a significant difference exists between cooler northern and milder southern sites. However two days later, when winds typically diminish and radiational cooling dominates, the distribution of coolest sites becomes more evenly distributed and focuses on relatively low spots including Nayak (east) and Binkley (south) where radiation cooling is maximized. Thus, the distribution is no longer based largely on wind speed and direction, but more on distance from downtown, the amount of natural surface, topography and soil type.

d) The Tallahassee Airport (TLH)

During July, the Tallahassee airport was one of the warmest four sites 45 percent of the time, but, as in June, was never one of the coldest. During the eight month study period (December-July), it was one of the warmest sites 27 percent and coldest only 4 percent of the time, with the warm percentage increasing and cold percentage decreasing as one goes from winter through summer. This continues to substantiate that, contrary to popular belief, the airport does not represent a cold valley in area temperatures. Rather, July readings continue to imply that it represents a warm anomaly, most pronounced during the warmer season. Minimum temperature forecasts for Leon County must address this seasonal variation.

## Summary

This is the eighth month of collecting Tallahassee area minimum temperature data including all of winter 2001-2002, plus the spring and initial half of summer 2002. During July, daily temperature ranges, (for cold vs mild nights and under varying synoptic conditions), were less than but comparable with those of June. Although temperature ranges during July, as well as for the entire summer season, were noticeably less than during previous seasons, they remain above average for a city of this size. Therefore, the notion that the summer would negate these temperature ranges has been hinted at

but not been validated. Rather, the data continue to imply that the Tallahassee urban heat island is more complex, and the minimum temperature ranges are significantly more varied, than previously anticipated. Although temperatures generally decrease with distance from downtown, several factors can alter this circular distribution. In particular, the daily spatial distribution of coldest temperatures appears to be related to synoptic factors, including the effect of frontal and post-frontal weather as well as topography, soil and land use type. Significantly, July data imply that warm season dynamics may significantly reduce the daily and monthly temperature ranges. Future reports will investigate the reasons for this in more detail.

As with any longer-term study, the current study has experienced a minor turnover of observers. Therefore, the coordinators of this study would like to solicit new observers to compliment the existing data base insuring a monthly geographical balance across Leon County. Anyone interested in participating in this study should contact Ron Block at ron.block@noaa.gov or 850-942-8833.